

October 16. Almost at the same time, a mild surge from the east quadrant appeared over Guam. As the depression center came into existence, Zamboanga and Cebu velocities were weak, but directions showed a tendency to shift to the northwest quadrant. This tendency also appeared in the directions of the lower clouds over stations of the Visayan Islands. Because of these weak velocities and the movement of cool air from northern regions around the regions south of the center into the weak southwesterly air stream, there was no development. Velocities of the upper winds over Cebu and Zamboanga reached values of 50 and 60 k. p. h. only on October 20, when the depression center was moving toward Verde Island Passage. Other days, values were below 40 k. p. h. Indications that the southwesterly air stream was weak over southern Indo-China and Thailand were shown by the scattered reports received from these regions.

Typhoon, October 22–November 2, 1941.—As well as can be determined from available data, this typhoon seems to have formed far to the southeast or south-southeast of Guam. On October 22, a definite center, quite intense, seemed to be located about 300 miles south-southeast of Guam, and its movement was in a north-northwesterly direction. From October 23 to 25, this typhoon moved northerly along a course about 120 miles east of Guam. The next 3 days, the center seemed to be close to and east

of the northern Mariana Islands, stationary perhaps, or moving slowly in various directions. October 28 to 31, it moved west-northwest to the ocean regions about 300 miles southwest of the Bonin Islands. It either disappeared over those regions or moved about 500 miles to the east as a low pressure area (October 31 to November 2) after which no trace of the storm could be found.

The upper winds over Guam from October 17 onward were from the northeast and east quadrants, the velocities never exceeding 47 k. p. h. and mostly between 5 and 30 k. p. h. On October 21, the winds were backing to the north-northeast, velocities being less than 40 k. p. h. On October 22 and the 2 following days, the directions were from the north-northwest and north, with velocities ranging from 15 to 67 k. p. h. On October 25 and the following days, Guam was under the influence of air streams from the west and southwest quadrants, with velocities less than 40 k. p. h. Stations over the Philippines were reporting directions from the northeast, east, and southeast quadrants during these days, with no evidence that the southwest monsoon air stream was present over the Archipelago.

After October 19, no ships' observations were on hand. The above account of the origin and course of the typhoon, especially after October 24, may have to be altered when such observations from ships become available later.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR DECEMBER 1941

[Climate and Crop Weather Division, J. B. KINGER in charge]

AEROLOGICAL OBSERVATIONS

By HOMER D. DYCK

Mean surface temperatures for December, as for the preceding months of the year, were above normal in practically all sections of the country. Nearly all sections reported means 2° to 10° F. above normal; the extreme Northeast, the Southern States and Pacific coast districts had the smallest plus departures, mostly 2° or 3° F., and the area from the Ohio and central Mississippi Valleys and southern Great Plains northward the largest, generally 5° to 11° F.

At 1,500 meters above sea level the 5 a. m. resultant winds for December were from directions to south of normal over most of the country with the exception of southern Texas, the north Pacific coast and several scattered stations where they were to north of normal. At 3,000 meters the morning resultant winds were to south of normal over practically all stations where a comparison was possible. These stations were located in the Rocky Mountain and Plateau regions, the central and northern Great Plains, the central Mississippi Valley, and the central Gulf States. At 5,000 meters a comparison of the afternoon resultants with the a. m. normals was possible only over the Rocky Mountain region, Oklahoma and Texas, and all resultants in these regions were to south of normal. It was in accordance with the tendency of resultant wind directions to turn to southward in most parts of the country that surface temperatures were above normal.

At 1,500 meters resultant wind velocities were below normal over the extreme northern Plateau and extreme northern Rocky Mountain region, the Southeast and the North and Middle Atlantic States, while they were above normal generally elsewhere. At 3,000 meters a comparison of December a. m. resultant velocities was not possible over the Pacific States, the Lake region and Texas. Velocities were below normal, however, over the northern Great Plains, Oklahoma and northern New

Mexico, and generally above normal elsewhere. At 5,000 meters the 9 stations where a comparison was possible showed December a. m. velocities above the p. m. normals.

When the 5 p. m. resultant directions are compared to the 5 a. m. resultant directions, no well-marked pattern of change is evident; and the number of stations where there was turning to southward during the day about equaled the number where the opposite shift took place at both 3,000 and 5,000 meters.

The 5 p. m. resultant velocities were lower than the 5 a. m. resultant velocities over the far Northwest, the Lake region, the middle Mississippi and Ohio Valleys and the central Gulf States and higher than the morning winds elsewhere. At 3,000 meters a comparison of a. m. and p. m. resultant velocities was not possible over the Pacific States, the Lake region and the Northeast. Afternoon velocities were lower than morning velocities, however, over the central Rocky Mountain region and the Southeast and generally higher elsewhere.

The upper air data discussed above are based on 5 a. m. (E. S. T.) pilot balloon observations (charts VIII and IX) as well as on observations made at 5 p. m. (table 2 and charts X and XI).

The highest mean monthly pressure was recorded at Miami, Fla., at all standard levels from 2,000 to 16,000 meters inclusive. Brownsville, Tex., also recorded the maximum at 16,000 meters. The lowest mean monthly pressure from 2,000 to 4,000 meters inclusive was recorded over Sault Ste. Marie, at 5,000 meters over Seattle, and at 6,000 meters over both Sault Ste. Marie and Seattle. From 7,000 to 14,000 meters the lowest mean monthly pressure was recorded over Seattle. At 13,000 meters the lowest mean was also recorded over Spokane while at 14,000 meters a number of stations, namely, Bismarck, Great Falls, Portland, Me., Sault Ste. Marie, Seattle and Spokane recorded the minimum. At 15,000 and 16,000 meters the lowest mean monthly pressure was recorded over Portland, Maine.

Except for a few small exceptions, mean monthly pressures were lower this month than last over the United States at all levels from the surface to 19,000 meters. Surface pressures were slightly higher than last month over the Lake Region, the Northeast and Florida. Decreases were considerable over the far Northwest amounting to as much as 12 millibars at Seattle from 5,000 to 7,000 meters. Pressure gradients were steeper in December than in November over the West and the South and about the same elsewhere. The steepest upper level pressure gradient for December occurred between Sault Ste. Marie and Detroit at levels from 6,000 to 9,000 meters inclusive, where there was a change of 1 millibar pressure for each 38 miles of horizontal distance between the two stations.

The mean temperatures for December were considerably lower than in November for nearly all stations from the surface to about 12,000 meters. Above this level to about 17,000 meters temperatures were generally higher over the western half of the country and the Northeast and generally lower elsewhere.

Mean temperatures for December 1941 were generally lower than those for December 1940 at levels up to about 10,000 meters over the western half of the country and the Northeast and higher over the remainder of the country. From 10,000 to about 17,000 meters temperatures tended to be higher than in December 1940 except over the Gulf States where they were slightly lower.

Temperatures for December at 1,000, 3,000 and 5,000 meters were generally below normal west of the Rocky Mountains and the extreme Northeast and above normal elsewhere.

Except for a few scattered exceptions, relative humidities for December were generally above normal at 1,000 meters. At the 3,000 and 5,000 meter levels humidities were generally above normal over the Northwest and the Lake region, and the extreme Northeast and generally below normal elsewhere.

The mean surface temperature for the month of December as recorded by radiosonde observations (table 1) was 0° or lower at all stations in the Northeast, the upper Lake region, the extreme northern Great Plains, the

extreme northern Rocky Mountain region and extreme northern Plateau region. The surface temperature at Ely, Nev., was also below 0° C. At Lakehurst, N. J., where the surface temperature averaged 0° C., an inversion occurred above the surface where the temperature was above 0° C. Over the rest of the United States the altitude at which a mean temperature of 0° C. occurred varied from the lowest (500 meters) over Buffalo, N. Y., to the highest (4,300 meters) over Miami, Fla. This level was much lower this month than last over the Plateau region, being 1,600 meters lower over Boise, Idaho.

The lowest free-air temperature recorded during the month over the United States was -82.7° C. (-116.9° F.) This temperature occurred over Brownsville, Tex., on December 5th at an altitude of 16,400 meters (about 10 miles) above sea level. The lowest temperature for the month over San Juan was -84.1° C. (-119.4° F.) observed at 18,200 meters (about 11.3 miles) above sea level on December 16th.

Table 3 shows the maximum free-air wind velocities for various sections of the United States during December as determined by pilot balloon observations. The highest observed wind velocity for the month was 84.0 m. p. s. (188 miles per hour) observed over Oklahoma City, Okla. on December 5. This wind was blowing from the west-southwest at an elevation of 9,970 meters (about 6.2 miles) above sea level.

The highest December wind velocity observed during the last 5 years in the free-air layer from the surface to 2,500 meters was 56.6 m. p. s. (127 miles per hour) observed blowing from the west on December 31, 1939 over Richmond, Va., at an altitude of 2,480 meters (about 1.5 miles). The highest observed wind velocity in the last 5 years for the free-air layer between 2,500 and 5,000 meters was 65.8 m. p. s. (147 miles per hour) observed blowing from north-northwest on December 27, 1940 over Abilene, Tex., at an altitude of 4,390 meters (about 2.7 miles). A still higher wind velocity, 92.2 m. p. s. (206 miles per hour) was observed during the same 5 year period in the layer above 5,000 meters. This wind was blowing from the northwest at an elevation of 8,910 meters (about 5.5 miles) over Casper, Wyo., on December 28, 1940.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during December 1941

[Stations with elevations in meters above sea level]

Altitude (meters), m. s. l.	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (605 m.)				Boise, Idaho (864 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)			
	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity
Surface	31	837	3.1	55	31	984	7.2	76	31	985	-5.3	77	28	915	1.1	82	31	1,017	16.1	92	31	991	0.6	80	31	1,018	9.5	89
500					31	961	9.0	66	31	897	-2.6	68	28	900	1.9	79	31	959	16.1	85	31	957	-1	81	31	961	11.3	72
1,000					31	906	9.1	68	31	842	-3.1	62	28	846	.1	76	31	905	14.2	76	31	899	-2.1	80	31	905	10.3	63
1,500					31	852	8.0	51	31	842	-3.1	62	28	846	.1	76	31	833	12.9	76	31	844	-3.4	76	31	852	8.6	55
2,000	31	799	3.5	54	31	802	7.1	43	31	790	-4.7	59	28	794	-2.5	73	31	803	11.5	58	31	792	-4.5	72	31	802	6.8	50
2,500	31	751	1.2	54	31	754	5.1	41	31	741	-7.2	57	28	746	-5.5	74	31	757	9.8	54	31	743	-6.3	67	31	754	5.3	43
3,000	31	706	-1.6	53	29	709	2.8	38	31	685	-9.5	56	28	699	-8.2	73	31	712	7.1	50	31	697	-8.2	63	30	709	2.9	42
4,000	31	622	-6.3	49	28	626	-3.0	36	31	610	-14.6	56	27	614	-14.3	71	31	630	1.5	45	30	612	-13.3	55	30	626	-2.7	40
5,000	31	546	-12.2	47	26	551	-9.1	34	31	534	-20.6	54	27	538	-20.2	70	31	556	-4.8	43	30	536	-19.3	52	30	551	-9.1	41
6,000	30	478	-19.1	43	26	484	-15.6	33	31	466	-27.3	54	27	469	-26.9	66	29	489	-11.7	44	30	468	-26.0	50	30	484	-16.0	42
7,000	30	417	-26.6	42	24	423	-22.3	33	31	404	-34.5	54	27	407	-34.2	63	28	428	-18.4	43	29	407	-33.4	48	30	423	-22.8	43
8,000	29	363	-34.0	42	24	368	-20.2	32	31	349	-41.9	57	27	352	-41.7	57	28	374	-25.4	40	27	352	-40.7	57	29	368	-20.9	47
9,000	29	314	-40.8	42	24	320	-36.5	31	31	300	-48.6	57	27	303	-48.0	57	27	324	-32.7	39	25	304	-47.1	57	28	319	-37.1	44
10,000	28	271	-46.4	42	24	276	-43.0	30	28	258	-53.4	57	27	260	-52.9	57	26	282	-40.4	57	24	261	-51.8	57	28	275	-44.7	57
11,000	27	232	-50.2	42	24	238	-49.7	29	221	25	-55.7	57	27	223	-55.0	57	23	242	-48.0	57	22	224	-54.9	57	28	237	-51.9	57
12,000	27	199	-53.6	23	204	-55.5	27	188	23	-55.7	57	27	191	-55.4	57	22	208	-55.2	57	20	191	-55.9	57	28	202	-58.1	57	
13,000	26	170	-56.6	22	174	-60.0	28	161	55.1	21	163	-54.9	57	19	177	-61.0	57	18	164	-57.8	57	26	172	-62.5	57			
14,000	25	145	-58.1	21	148	-62.2	22	137	54.9	17	139	-55.0	57	16	151	-55.6	57	13	140	-59.3	57	24	146	-64.8	57			
15,000	23	124	-59.8	20	126	-64.6	15	117	55.6	14	118	-56.1	57	15	128	-70.5	57	11	118	-61.1	57	22	124	-68.0	57			
16,000	21	106	-61.6	19	107	-66.2	10	101	55.7	11	101	-56.7	57	12	108	-73.6	57	9	101	-61.1	57	19	105	-70.5	57			
17,000	18	90	-62.6	13	90	-67.7	5	86	-56.8	6	91	-76.6	57	7	86	-61.1	57	15	89	-70.2	57	8	75	-69.6	57			
18,000	11	77	-63.1	5	76	-67.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	

See footnotes at end of table.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during December 1941—Continued

Altitude (meters) in s.s.l.	Denver, Colo. (1,616 m.)			Detroit, Mich. (194 m.)			El Paso, Tex. (1,193 m.)			Ely, Nev. (1,908 m.)			Great Falls, Mont. (1,128 m.)			Huntington, W. Va. (172 m.)			Joliet, Ill. (178 m.)						
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	
Surface	31	834	-3.0	65	31	993	0.0	84	31	882	6.8	57	31	806	-3.2	84	30	884	-3.0	68	31	999	3.5	83	
500					31	956	-3.3	81									31	960	4.5	75	30	957	1.0	86	
1,000					31	898	-1.3	77									31	902	2.8	71	30	899	-1.1	82	
1,500					31	843	-1.7	66	31	850	9.0	47					30	843	-3.3	68	31	848	1.1	68	
2,000	31	796	1.4	58	31	792	-3.0	60	31	800	0.5	43	31	797	-2.2	81	30	791	-5.6	68	31	797	-1	60	
2,500	31	748	-3	54	31	743	-4.7	54	31	753	4.1	38	31	748	-3.5	76	30	742	-7.7	67	31	748	-1.6	55	
3,000	31	702	-3.1	52	31	697	-6.5	50	31	708	1.5	36	31	702	-6.0	74	30	695	-9.9	66	31	703	-3.7	51	
4,000	31	618	-9.2	50	29	613	-11.1	43	31	624	-4.0	33	31	617	-10.9	71	30	610	-15.5	64	31	618	-9.0	49	
5,000	30	542	-15.6	48	29	538	-17.2	40	30	549	-10.5	31	31	542	-17.3	65	30	534	-22.1	64	30	543	-14.9	46	
6,000	30	474	-22.8	46	29	470	-23.6	38	29	481	-17.7	30	31	473	-24.8	60	30	465	-28.8	63	30	475	-21.9	44	
7,000	30	413	-30.4	46	28	408	-30.6	37	28	420	-24.1	28	31	411	-32.5	58	30	403	-36.5	63	30	413	-28.4	40	
8,000	30	368	-38.1	46	27	354	-37.4	36	28	366	-30.8	27	30	356	-39.5	56	29	348	-44.1	7	29	359	-35.0	39	
9,000	29	309	-45.1	—	26	306	-44.2	—	27	317	-37.8	27	28	307	-45.9	—	29	299	-50.7	—	26	310	-42.4	—	
10,000	28	265	-50.4	—	26	263	-49.1	—	27	274	-44.4	—	27	263	-51.2	—	28	257	-54.8	—	25	267	-48.1	—	
11,000	28	227	-54.2	—	26	226	-52.8	—	27	235	-50.2	—	25	226	-64.6	—	28	220	-56.4	—	20	229	-53.2	—	
12,000	26	194	-55.8	—	25	193	-53.9	—	26	201	-54.5	—	24	192	-56.3	—	28	188	-56.0	—	20	196	-55.9	—	
13,000	25	166	-56.5	—	24	165	-55.0	—	25	172	-57.4	—	22	164	-56.6	—	25	160	-55.4	—	17	167	-57.0	—	
14,000	23	142	-57.1	—	20	141	-56.4	—	25	147	-60.7	—	20	140	-57.2	—	19	137	-55.5	—	14	143	-59.2	—	
15,000	23	121	-57.9	—	17	120	-57.5	—	25	124	-63.1	—	10	119	-59.1	—	16	117	-56.1	—	10	121	-61.2	—	
16,000	19	103	-58.9	—	15	102	-58.3	—	21	105	-65.8	—	11	102	-60.5	—	7	100	-56.9	—	8	103	-62.4	—	
17,000	12	88	-59.9	—	10	87	-58.4	—	17	90	-67.3	—	6	86	-60.5	—						10	102	-59.2	—
18,000				6	74	-58.6	—	10	76	-67.8	—											13	87	-59.8	—
19,000				6	74	-58.6	—	5	64	-67.3	—											9	74	-59.7	—
																						6	64	-59.1	—

See footnotes at end of table.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during December 1941—Continued

Altitude (meters), m. s. l.	San Antonio, Tex. (174 m.)			San Diego, Calif. ¹ (19 m.)			Sault Ste. Marie, Mich. (221 m.)			Seattle, Wash. ¹ (27 m.)			Spokane, Wash. (598 m.)			Washington, D. C. (25 m.)			Anchorage, Alaska (42 m.)									
	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity				
Surface	31	988	11.5	81	27	1,014	13.5	84	31	988	-4.2	87	20	1,010	4.6	83	31	943	0.1	88	29	1,017	4.0	73	31	995	-7.9	85
500	31	981	12.8	71	27	957	12.8	60	31	954	-5.3	88	20	953	1.9	79	29	959	3.9	89	30	958	-4.6	75	31	939	-4.6	75
1,000	31	905	11.6	66	27	902	10.7	50	31	895	-6.4	86	20	896	-1.1	78	31	897	-1.0	87	29	902	1.9	63	31	881	-5.5	68
1,500	31	853	9.8	57	27	850	8.4	42	31	840	-6.4	84	20	840	-3.9	81	31	842	-3.3	85	29	848	.6	61	31	826	-8.2	70
2,000	31	802	8.2	48	27	800	5.6	38	31	787	-7.7	74	20	789	-6.5	80	31	790	-5.8	82	29	796	-6.6	58	31	775	-11.4	74
2,500	31	755	7.1	43	27	752	4.0	31	31	738	-9.4	70	20	740	-9.3	75	31	741	-8.0	78	29	748	-2.0	53	31	725	-14.3	75
3,000	31	710	5.0	39	27	706	1.1	29	31	692	-11.5	68	20	683	-12.3	70	31	695	-10.5	74	29	702	-3.9	48	30	679	-17.1	73
4,000	31	628	-1.6	33	27	623	-4.4	27	31	606	-16.6	65	20	607	-18.5	58	31	609	-16.2	68	29	618	-10.0	45	30	593	-23.3	69
5,000	31	553	-7.3	31	27	548	-10.8	27	30	531	-22.6	61	20	530	-24.6	58	30	533	-22.2	65	29	542	-15.5	42	29	516	-29.7	67
6,000	31	486	-13.7	30	26	480	-18.3	31	30	462	-29.4	66	19	462	-31.1	61	30	464	-29.0	62	29	474	-22.3	42	28	448	-36.4	65
7,000	30	425	-20.7	27	26	419	-25.1	37	30	401	-36.4	60	18	400	-37.7	67	30	402	-36.5	59	27	413	-29.4	40	28	387	-43.2	---
8,000	30	371	-27.6	26	24	364	-33.3	---	29	346	-43.2	---	17	345	-44.5	---	28	348	-43.8	---	27	355	-35.9	39	28	333	-49.5	---
9,000	30	322	-34.5	26	23	315	-40.7	---	28	298	-48.5	---	16	297	-49.8	---	28	299	-49.7	---	27	309	-42.3	---	27	286	-54.3	---
10,000	28	278	-41.3	---	22	271	-47.2	---	25	256	-52.2	---	15	254	-53.1	---	27	256	-53.6	---	26	266	-48.4	---	27	244	-56.2	---
11,000	27	240	-48.0	---	20	233	-52.7	---	23	220	-53.6	---	14	218	-53.5	---	27	220	-53.5	---	26	229	-54.0	---	25	209	-55.0	---
12,000	27	205	-54.1	---	19	199	-56.5	---	22	188	-54.1	---	13	187	-51.7	---	25	188	-55.0	---	26	195	-57.4	---	24	178	-54.6	---
13,000	26	175	-59.2	---	17	170	-59.9	---	22	161	-54.9	---	13	160	-51.5	---	24	160	-54.1	---	24	166	-59.4	---	23	152	-53.2	---
14,000	26	149	-62.8	---	9	145	-61.6	---	19	137	-55.9	---	11	137	-52.6	---	24	137	-54.6	---	21	142	-60.7	---	21	130	-52.7	---
15,000	22	127	-65.8	---	8	123	-63.1	---	9	117	-56.3	---	7	117	-53.3	---	20	118	-55.2	---	16	120	-63.5	---	16	111	-52.0	---
16,000	19	107	-68.2	---	6	104	-65.0	---	5	100	-56.7	---	7	100	-55.7	---	11	100	-55.7	---	13	102	-65.6	---	8	95	-51.2	---
17,000	18	91	-69.8	---	7	88	-66.5	---	6	84	-64.3	---	5	84	-62.0	---	8	86	-66.5	---	9	87	-66.5	---	6	73	-66.6	---
18,000	13	77	-69.5	---	6	74	-66.2	---	5	70	-64.0	---	4	70	-61.7	---	7	70	-64.0	---	5	71	-66.6	---	4	64	-64.0	---
19,000	6	65	-68.3	---	5	62	-65.0	---	4	58	-62.7	---	3	58	-60.4	---	6	60	-62.7	---	4	61	-66.6	---	3	56	-66.0	---

LATE FOR REPORTS NOVEMBER 1941

Altitude (meters), m. s. l.	Fairbanks, Alaska (156 m.)			Juneau, Alaska (49 m.)			Ketchikan, Alaska (26 m.)			San Juan, P. R. (15 m.)			Swan Island, West Indies (10 m.)			Pearl Harbor, T. H. (7 m.)			Swan Island, West Indies (10 m.)									
	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity	Number of observations	Pressure	Temperature	Relative hu- midity				
Surface	31	986	-18.5	78	31	1,000	-0.9	82	28	1,004	2.0	83	28	1,014	24.0	89	31	1,013	26.0	84	24	1,014	23.1	80	30	1012	26.2	80
500	31	943	-13.7	77	31	945	-3.2	80	28	946	-0.2	84	25	960	21.9	90	31	957	23.1	87	24	943	20.3	78	30	958	23.3	83
1,000	31	883	-11.5	74	31	887	-5.5	80	28	889	-3.1	82	23	907	18.8	88	31	904	20.2	84	24	904	17.6	78	30	904	20.3	79
1,500	31	827	-11.1	69	31	832	-7.8	80	28	834	-5.8	79	23	856	15.7	85	31	853	17.4	81	24	853	15.5	68	30	853	17.6	75
2,000	31	775	-13.5	67	30	780	-10.0	78	25	782	-8.4	75	23	806	13.0	80	31	804	15.0	76	24	804	14.7	46	30	804	14.8	74
2,500	31	725	-16.2	66	29	730	-12.7	77	27	733	-11.0	69	28	739	11.1	65	31	758	12.8	69	24	758	13.2	34	30	758	12.3	70
3,000	31	678	-19.2	63	29	684	-15.6	69	27	687	-14.0	65	28	715	9.1	52	31	714	10.4	62	24	714	11.0	29	30	714	10.3	60
4,000	31	592	-25.5	62	27	598	-22.0	61	27	601	-20.0	61	28	633	3.9	40	30	633	5.9	47	24	632	5.1	29	30	633	5.7	53
5,000	30	515	-32.0	60	27	521	-28.2	67	27	524	-26.3	61	27	560	-1.3	33	29	580	0.7	41	24	558	-0.7	30	30	560	0.7	45
6,000	28	446	-38.9	59	24	453	-33.8	65	28	456	-32.8	60	27	493	-7.0	28	28	494	-5.2	39	24	491	-7.4	30	29	484	-5.0	45
7,000	27	385	-45.6	50	20	391	-40.7	24	24	394	-39.1	61	26	433	-13.5	26	28	434	-11.5	38	23	432	-14.1	26	29	434	-11.4	43
8,000	22	330	-51.6	50	20	337	-46.3	22	24	340	-44.8	88	24	379	-20.3	24	28	381	-18.5	37	23	378	-21.0	24	29	380	-18.1	41
9,000	20	283	-56.4	50	18	289	-50.8	20	292	-49.1	50	23	330	-27.5	23	28	332	-25.8	37	22	329	-28.6	22	28	332	-25.1	39	
10,000	19	241	-58.8	50	18	251	-51.8	50	23	257	-34.8	22	27	289	-33.3	36	21	286	-35.6	22	27	286	-32.2	38	28	286	-32.2	38
11,000	16	206	-58.7	50	16	212	-53.9	50	16	215	-53.4	50	23	248	-42.3	50	26	249	-40.9	18	24	247	-42.3	50	25	250	-39.9	50
12,000	13	175	-57.5	50	15	181	-54.0	50	14	184	-53.0	50	23	214	-49.7	50	26											

TABLE 2.—Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during December 1941.
Directions given in degrees from North ($N=360^\circ$, $E=90^\circ$, $S=180^\circ$, $W=270^\circ$)—Velocities in meters per second

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (866 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)					
	Observations			Observations			Observations			Observations			Observations			Observations			Observations			Observations			Observations			Observations			Observations			Observations								
		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity		Observations	Direction	Velocity						
Surface	29	217	1.8	31	276	2.4	27	317	1.5	27	247	3.7	30	272	2.0	27	125	2.2	26	53	2.7	29	250	2.7	30	212	0.4	28	217	0.5	27	252	2.7	30	247	1.3	28	74	0.4			
500	—	—	—	—	27	317	2.0	—	—	—	—	—	—	—	—	—	25	73	3.4	29	242	5.1	30	230	3.5	28	274	0.9	27	238	4.1	30	233	3.0	—	—	—					
1,000	30	208	4.1	—	—	—	—	27	244	1.4	—	—	—	30	269	4.0	27	136	3.2	21	64	1.8	21	246	9.2	25	263	6.4	27	261	5.1	25	244	6.5	—	—	—					
1,500	26	240	5.6	—	—	—	—	26	284	4.5	27	247	7.0	29	290	6.1	27	17	278	2.1	15	266	8.4	19	281	8.0	27	264	6.4	17	266	8.3	22	254	8.5	—	—	—				
2,000	26	254	8.4	31	263	2.7	26	280	7.8	27	261	7.4	27	292	7.0	25	169	4.2	10	260	9.4	13	309	12.2	26	265	8.3	15	273	12.0	18	268	10.2	28	212	0.7	—	—				
2,500	26	256	9.5	30	269	4.9	25	283	9.9	27	270	8.4	25	294	10.0	22	224	6.0	13	237	5.4	—	—	—	26	264	9.6	16	272	12.8	26	278	12.9	16	281	14.3	28	286	4.3	—	—	
3,000	25	255	10.5	28	269	7.2	24	278	11.6	25	275	9.8	24	292	12.2	20	240	6.6	13	235	6.2	—	—	—	26	266	12.0	11	272	16.2	16	281	14.3	28	286	7.5	—	—				
4,000	24	261	13.5	24	283	10.5	23	276	15.6	22	278	15.6	23	286	13.9	10	257	5.0	11	244	10.4	—	—	—	20	266	20.6	—	—	—	24	283	11.4	—	—	—						
5,000	22	263	15.6	21	275	12.9	22	273	20.0	18	282	14.7	22	277	14.6	10	283	13.9	10	266	8.8	—	—	—	17	269	24.1	—	—	—	23	275	12.2	—	—	—						
6,000	19	264	16.9	19	267	14.3	19	278	22.6	16	288	15.2	20	283	17.9	10	266	—	—	—	—	—	—	—	18	292	17.6	—	—	—	12	288	24.3	—	—	—						
8,000	13	262	22.1	12	275	19.5	—	—	—	—	—	—	15	286	22.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—							
10,000	12	260	26.5	—	—	—	—	—	—	—	—	—	10	287	25.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—							
Surface	31	276	2.3	31	181	2.2	30	303	0.6	28	274	1.1	28	246	3.9	29	29	1.2	31	73	0.2	27	265	1.0	24	345	0.6	31	86	1.9	27	272	0.9	23	337	1.6	28	230	1.3			
500	—	—	—	—	—	—	—	28	262	2.9	27	270	4.7	28	248	7.6	27	232	3.0	31	133	0.6	27	263	2.8	24	26	0.2	31	85	3.1	27	244	2.3	28	209	2.7	—	—	—		
1,000	—	—	—	—	—	—	—	27	277	7.5	27	261	11.7	25	234	4.5	30	195	1.7	21	273	3.8	23	283	3.5	24	292	1.3	21	237	2.4	28	332	2.4	27	217	4.0	—	—			
1,500	31	268	2.9	31	173	2.8	30	286	0.7	27	280	10.4	26	268	11.6	23	263	6.1	30	217	2.5	19	265	5.5	17	222	6.9	27	259	12.0	22	332	2.4	28	209	2.7	—	—				
2,000	31	262	3.8	31	197	2.8	30	286	0.7	27	280	10.4	26	268	11.6	23	263	6.1	30	217	2.5	19	265	5.5	17	222	6.9	27	259	12.0	22	332	2.4	28	209	2.7	—	—				
2,500	31	264	6.7	31	199	3.6	30	191	2.7	23	282	11.6	23	272	12.6	22	273	7.0	20	232	5.2	19	264	8.6	11	224	8.0	24	249	3.6	18	285	9.3	28	285	9.3	—	—	—			
3,000	29	274	8.6	27	233	4.1	30	228	4.2	25	277	14.1	22	280	13.2	21	273	9.5	28	248	6.9	16	277	11.2	11	240	9.2	13	283	13.1	21	267	7.7	17	285	9.3	28	285	10.1	—	—	
4,000	27	279	12.2	23	259	9.6	21	256	8.5	24	284	18.5	17	284	18.2	20	266	12.8	26	260	8.1	13	273	17.6	20	274	14.0	—	—	—	18	256	9.4	15	295	19.5	13	255	14.5	—	—	—
5,000	25	278	11.8	17	262	12.1	18	278	9.4	21	278	20.9	14	288	13.6	18	268	15.4	21	267	10.8	—	—	—	18	256	9.4	15	295	19.5	13	255	14.5	—	—	—						
6,000	24	278	15.7	15	275	12.8	13	290	13.0	19	275	24.6	13	296	14.2	14	273	17.6	20	274	14.0	—	—	—	16	262	12.2	14	294	21.8	—	—	—	16	262	18.1	10	309	28.8	—	—	—
8,000	20	279	20.3	10	296	17.4	—	—	14	276	33.6	—	—	—	—	—	11	293	18.6	—	—	—	—	—	11	269	21.1	—	—	—	—	—	—	—	—	—	—	—				
10,000	13	295	20.8	10	300	23.0	—	—	—	—	—	—	—	—	—	—	11	293	18.6	—	—	—	—	—	11	269	21.1	—	—	—	—	—	—	—	—	—	—	—				
Surface	27	296	4.8	29	216	2.3	27	248	1.5	26	270	1.9	31	150	0.3	28	325	1.2	30	234	1.7	28	31	1.2	28	275	2.5	21	304	2.8	26	174	1.1	26	164	0.9	29	298	2.4			
500	27	286	7.0	29	255	3.0	27	276	0.9	26	267	3.2	31	160	0.4	—	321	1.3	27	254	5.7	24	227	2.1	27	278	1.3	15	298	3.2	26	182	2.4	27	275	6.9	—	—	—			
1,000	26	293	8.8	26	268	4.2	27	227	3.6	23	275	5.4	31	161	1.5	28	285	4.0	22	260	7.9	24	245	3.9	27	279	1.7	—	—	16	179	3.8	20	203	2.9	27	288	9.3	—	—	—	
1,500	20	292	11.2	21	284	5.5	24	261	4.4	18	265	8.0	31	191	2.3	28	285	4.0	22	260	7.9	24	245	3.9	27	279	1.7	—	—	14	182	3.3	15	202	3.9	25	285	11.0	—	—	—	
2,000	12	311	10.9	18	290	6.9	23	270	6.6	15	276	10.3	30	222	3.0	28	286	5.9	22	260	9.2	22	253	5.7	24	280	2.4	—	—	12	212	2.6	13	219	4.2	21	289	12.9	—	—	—	
2,500	15	288	9.1	23	267	9.0	14	278	11.7	29	253	4.1	26	287	9.3	18	266	10.1	22	253	7.7	23	275	4.1	—	—	11	306	1.2	12	240	3.8	20	289	14.3	—	—	—				
3,000	14	296	10.9	22																																						

TABLE 3.—Maximum free air wind velocities (m. p. s.), for different sections of the United States based on pilot balloon observations during December 1941

Section	Surface to 2,500 meters (m. s. l.)				Between 2,500 and 5,000 meters (m. s. l.)				Above 5,000 meters (m. s. l.)						
	Maximum velocity	Direction	Altitude (m. s. l.)	Date	Station	Maximum velocity	Direction	Altitude (m. s. l.)	Date	Station	Maximum velocity	Direction	Altitude (m. s. l.)	Date	Station
Northeast ¹	43.1	WNW	1,910	4	Caribou, Maine	51.6	WSW	4,800	26	Pittsburgh, Pa.	57.5	NW	5,650	21	Portland, Maine
East-Central ²	43.6	SW	1,150	22	Louisville, Ky.	50.6	NNW	4,170	6	Knoxville, Tenn.	81.8	WSW	7,410	26	Huntington, W. Va.
Southeast ³	34.5	WSW	1,910	23	Birmingham, Ala.	46.6	NNW	4,020	6	Atlanta, Ga.	66.0	WNW	11,020	31	Jacksonville, Fla.
North-Central ⁴	50.4	SW	1,570	3	Marquette, Mich.	47.2	WNW	4,610	13	LaCrosse, Wis.	78.0	N	8,740	5	Fargo, N. Dak.
Central ⁵	43.5	SSW	1,110	4	Omaha, Nebr.	51.2	NW	4,710	8	Des Moines, Iowa	73.6	W	12,470	6	Wichita, Kans.
South-Central ⁶	37.6	WSW	1,900	25	Houston, Tex.	44.4	SW	3,690	25	Waco, Tex.	84.0	WSW	9,970	5	Oklahoma City, Okla.
Northwest ⁷	36.1	WSW	2,480	19	Great Falls, Mont.	45.0	WSW	2,840	19	Great Falls, Mont.	62.0	WNW	8,230	18	Great Falls, Mont.
West-Central ⁸	42.6	SW	2,420	3	Casper, Wyo.	52.6	SW	5,000	18	Ely, Nev.	66.0	NNW	12,770	2	Pueblo, Colo.
Southwest ⁹	48.8	NW	1,390	24	Burbank, Calif.	47.5	WNW	4,220	25	El Paso, Tex.	77.5	W	7,380	4	Albuquerque, N. Mex.

¹ Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.

² Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, eastern Tennessee, and North Carolina.

³ South Carolina, Georgia, Florida, and Alabama.

⁴ Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.

⁵ Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.

⁶ Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.

⁷ Montana, Idaho, Washington, and Oregon.

⁸ Wyoming, Colorado, Utah, northern Nevada, and northern California.

⁹ Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

AEROLOGICAL SUMMARY FOR THE YEAR 1941

By HOMER D. DYCK

At the end of 1941, radiosonde observations were being taken at a total of 40 Weather Bureau stations. This number included 29 in the United States, 7 in Alaska, 1 at San Juan, P. R., 1 at Swan Island, and 2 on ships at sea. In addition, 5 Navy stations were taking radiosonde observations and 3 Navy stations were taking airplane observations. At the end of the previous year there were 26 Weather Bureau stations taking radiosonde observations while the number of Navy stations was the same.

Beginning in April, observations were taken twice a day at all Weather Bureau radiosonde stations in the United States. The customary special upper air observations were taken during the hurricane season at selected stations in the United States and West Indies. Radiosonde observations on board Coast Guard cutters were continued in 1941.

Monthly mean values of temperature, pressure, and relative humidity for all the standard levels of the free air have been published each month as table 1 under Aerological Observations in the MONTHLY WEATHER REVIEW.

Table 1 for the year 1941, tabulates annual mean pressures, temperatures and relative humidities for all stations for which such data were available. The annual mean values shown in table 1 are computed by averaging mean monthly values so that data for each month are given the same weight. The number of observations for each month and level may be found by referring to the previously published monthly tables.

Annual mean values for both 1940 and 1941 are available for 18 stations in the United States. These stations are shown in the annual table No. 1 for each of these 2 years and are as follows: Bismarck, N. Dak., Charleston, S. C., Denver, Colo., El Paso, Tex., Ely, Nev., Lakehurst, N. J., Medford, Oreg., Nashville, Tenn., Norfolk, Va., Oakland, Calif., Oklahoma City, Okla., Omaha, Nebr., Pensacola, Fla., Phoenix, Ariz., San Diego, Calif., Sault Ste. Marie, Mich., Seattle, Wash., and Washington, D. C.

Based on available annual mean values it is found that up to about 10,000 meters, temperatures were higher in 1941 than in 1940 east of the Rocky Mountains and lower to the west of them. Above 10,000 meters temperatures were generally higher in 1941 than in 1940 over all parts of the country. It may be noted that surface temperatures in 1940 averaged above normal over the western

half of the country and below normal over the eastern half whereas in 1941 temperatures averaged above normal over the entire country.

Annual mean relative humidities were generally higher in 1941 than in 1940 over the western half of the country and lower over the eastern half up to about 4,000 meters. In this connection it may be noted that although precipitation was above normal over the western half of the country in 1940, it was even greater in 1941, while in the East, although precipitation was nearly normal in 1940, it was considerably below normal in 1941. It may be said then that conditions leading to heavy precipitation over the western half of the country and low precipitation over the eastern half were intensified in 1941.

Following much the same pattern as shown by the comparisons of 1940 and 1941 temperatures and relative humidities, mean annual pressures for 1941 were higher than in 1940 over the eastern half of the country and lower over the western half up to about 13,000 meters. From 13,000 to 17,000 meters pressures averaged the same or higher than in 1940.

At the end of 1941, the Weather Bureau had 143 pilot-balloon stations of which 129 were in the United States, 11 in Alaska, 1 in Swan Island, 1 in Puerto Rico and 1 in Hawaii. This represented an increase of 11 stations over a year ago. All pilot balloon stations were using helium gas for inflation and nearly all stations in the United States were making 4 observations daily.

At the end of the year 51 stations were using 100-gram balloons for the 5 p. m. (E. S. T.) observations, representing an increase of 10 for the year. The higher ascensional rate of these balloons permits observations of winds at much higher levels than with the use of the 30-gram balloons.

Plans for reducing radiosonde data to punch cards were completed during the year as well as plans for continuation of punching of current pilot balloon and radiosonde data.

The lowest observed free-air temperature in the United States during 1941 was -87.9° C. observed over Miami, Fla., on January 2, at a height of 16,900 meters (about 12 miles) above sea level.

Monthly resultant wind directions and velocities have been computed for the 1,500 and 3,000 m. levels from the 5 a. m. (E. S. T.) observations for all stations and have been shown each month in the MONTHLY WEATHER REVIEW on charts VIII and IX. Similar 5 p. m. result-

ants have been computed for the 5,000 and 10,000 meter levels and shown on charts X and XI. Monthly resultants (5 p.m., E.S.T.) have also been computed for all standard levels at 39 selected stations. These resultants have been published regularly in the REVIEW as table 2 of the Aerological Summary.

The 1941 annual 5 p.m. resultants are shown in table 2 for the selected list of stations. At most of the standard levels up to and including 4,000 meters, a turning to southward from 1940 was noted. Exceptions were a turning to northward from the previous year over California and in the Northeast. It may be noted at this point that mean surface temperatures for the United States as a whole were higher in 1941 than in 1940.

At standard levels from the surface up to about 3,000 meters annual wind resultant velocities had a tendency to be lower in 1941 than in 1940 over the Southeastern States and the West and higher over the remainder of the country.

Table 3 shows the maximum free-air wind velocities and their directions for various sections of the United States during the year 1941 as determined by pilot balloon observations. The extreme velocity for the year was 91.6

meters per second (205 miles per hour). During the last 5 years the extreme wind velocity for the year occurred in the layer above 5,000 meters. The highest velocity during the last 5 years was 98.4 m.p.s. (220 miles per hour) recorded in November 1940. In the layer between 2,500 and 5,000 meters the highest velocity in the last 5 years occurred in February 1941. (See Table 3.) The highest velocity in the layer below 2,500 meters during the 5-year period was 63.3 m.p.s. (142 miles per hour) in June 1938.

Table 4 gives a tabulation by months of the altitude of the level at which a mean temperature of 0° C. was observed at all stations making either airplane or radiosonde observations. The level of mean freezing temperatures was highest over the northern half of the country in July and over the southern half in August. This level reached a mean maximum altitude over Phoenix, Ariz., and San Antonio, Tex., in August when it was at an altitude of 5,100 meters (about 3.2 miles).

A more detailed comparison of upper air conditions of the years 1940 and 1941 can be made by reference to the 1940 Annual Summary of Aerological Observations which was published in the MONTHLY WEATHER REVIEW for December 1940.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during year 1941

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																		El Paso, Tex. (1,193 m.)									
	Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (605 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)				Denver, Colo. (1,616 m.)							
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity				
Surface	315	983	15.0	76	363	956	4.8	79	366	1,015	20.9	90	348	990	7.3	79	365	1,016	15.3	88	355	838	7.2	69	355	882	15.5	56
500	314	961	16.1	69	366	958	6.3	70	366	904	19.7	85	348	958	7.9	74	365	980	16.3	71	-----	-----	-----	-----	-----	-----	-----	-----
1,000	314	906	14.4	66	362	900	6.3	70	366	904	17.7	76	348	901	5.6	72	365	905	13.9	65	-----	-----	-----	-----	-----	-----	-----	-----
1,500	314	854	12.0	64	362	847	5.1	67	366	853	15.7	67	348	847	3.2	70	365	853	11.4	62	-----	-----	-----	-----	-----	-----	-----	-----
2,000	314	804	9.7	61	362	796	3.2	64	366	804	13.7	60	347	796	1.2	67	365	803	9.0	58	354	800	8.5	61	355	851	15.8	52
2,500	314	757	7.2	57	362	748	.7	62	366	757	11.4	54	346	748	-1.0	63	365	756	6.7	53	353	752	5.7	57	355	755	9.6	51
3,000	314	712	4.5	55	362	703	-2.0	61	365	713	8.8	51	345	702	-3.2	59	364	711	4.2	50	353	707	2.6	57	355	710	6.1	52
4,000	309	629	-0.9	50	358	619	-7.9	58	362	632	2.9	48	340	618	-8.2	53	362	628	-1.1	46	349	624	-4.4	58	352	628	-0.7	53
5,000	308	554	-6.6	46	358	544	-14.3	55	361	558	-3.4	47	335	543	-14.1	49	357	554	-7.0	44	345	549	-11.4	58	350	554	-7.3	51
6,000	305	487	-12.8	42	357	476	-21.1	52	356	491	-10.1	45	332	475	-20.6	47	363	486	-13.4	42	336	481	-18.3	55	346	486	-14.0	48
7,000	297	426	-19.5	40	356	415	-28.2	51	361	430	-16.9	43	327	414	-27.6	44	351	426	-20.1	40	334	420	-25.4	51	340	426	-21.1	44
8,000	295	372	-26.5	352	360	-35.4	347	376	-23.8	41	319	360	-34.6	348	-27.1	371	27.3	40	328	365	-33.0	48	337	371	-27.8	42		
9,000	293	323	-33.5	347	311	-42.6	340	327	-31.0	40	311	311	-41.3	345	-34.8	322	-34.8	38	318	316	-40.3	-----	333	322	-34.9	42		
10,000	288	280	-40.5	344	268	-49.0	336	284	-38.3	300	268	-47.1	341	279	-42.1	308	272	-47.0	326	278	-42.1	-----	-----	-----	-----	-----	-----	
11,000	-----	-----	-----	336	230	-53.2	328	245	-45.4	292	230	-51.1	339	240	-49.0	290	234	-52.1	325	240	-48.5	-----	-----	-----	-----	-----	-----	
12,000	-----	-----	-----	331	196	-54.8	317	210	-52.2	280	197	-53.9	336	208	-54.7	280	200	-56.2	321	208	-53.7	-----	-----	-----	-----	-----	-----	
13,000	-----	-----	-----	327	168	-55.3	307	180	-57.6	270	168	-56.3	325	175	-59.4	284	171	-57.1	311	176	-57.9	-----	-----	-----	-----	-----	-----	
14,000	-----	-----	-----	318	144	-55.8	298	153	-63.9	253	144	-57.7	318	149	-63.2	251	146	-58.7	305	150	-61.8	-----	-----	-----	-----	-----	-----	
15,000	-----	-----	-----	295	122	-56.0	284	130	-68.5	231	123	-58.8	306	127	-66.4	237	124	-60.4	268	127	-64.9	-----	-----	-----	-----	-----	-----	
16,000	-----	-----	-----	265	105	-57.2	258	110	-71.7	206	104	-59.4	286	107	-68.1	207	106	-61.3	279	108	-66.9	-----	-----	-----	-----	-----	-----	
17,000	-----	-----	-----	202	90	-52.6	222	93	-72.6	173	90	-59.1	256	91	-67.9	171	90	-61.3	257	91	-66.7	-----	-----	-----	-----	-----	-----	
18,000	-----	-----	-----	-----	-----	-----	160	78	-69.9	-----	-----	-----	205	77	-68.3	98	77	-60.5	206	77	-65.0	-----	-----	-----	-----	-----	-----	
19,000	-----	-----	-----	-----	-----	-----	101	66	-66.3	-----	-----	-----	130	67	-63.7	-----	-----	-----	124	66	-62.6	-----	-----	-----	-----	-----	-----	

See footnotes at end of table.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during year 1941—Continued

Altitude (meters) m. s. l.	Ely, Nev. (1,908 m.)			Great Falls, Mont. (1,127 m.)			Lakehurst, N. J. (39 m.)			Medford, Oreg. (401 m.)			Miami, Fla. (4 m.)			Nashville, Tenn. (180 m.)			Norfolk, Va. ^{1,2} (10 m.)										
	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations								
Surface	364	809	4.6	69	363	886	6.9	62	353	1012	968	11.8	71	362	1017	20.8	89	365	997	13.7	75	283	1019	12.9	77				
500									353	958	8.7	70	363	956	12.5	69	362	960	19.9	85	365	960	14.5	68	283	981	13.2	62	
1,000									353	901	6.9	66	363	901	10.9	65	362	906	17.0	81	365	904	12.0	68	283	905	11.0	58	
1,500									353	848	4.9	62	363	848	7.9	67	362	855	14.4	74	364	852	9.6	67	282	852	8.8	55	
2,000	364	800	6.2	65	362	797	4.5	58	353	797	2.8	59	363	798	4.9	68	362	805	12.2	56	364	802	7.2	64	282	802	6.6	53	
2,500	364	752	5.0	60	361	749	1.3	59	353	749	0.7	56	363	750	2.0	66	362	758	9.9	58	363	754	4.8	60	280	754	4.3	49	
3,000	364	707	1.6	59	360	704	-2.0	60	353	704	-1.7	53	363	705	-0.8	61	362	714	7.5	53	362	709	2.4	57	279	709	1.8	45	
4,000	363	624	-5.2	58	359	620	-8.4	61	351	620	-6.9	49	360	621	-6.7	55	360	632	2.1	47	356	626	-3.0	50	273	625	-3.6	41	
5,000	362	549	-12.1	56	359	544	-14.9	58	347	544	-12.6	46	359	546	-13.1	51	357	558	-3.8	45	351	551	-8.8	46	224	550	-10.0	36	
6,000	361	480	-19.1	53	357	476	-21.6	55	339	477	-18.9	45	357	478	-20.0	49	352	491	-10.0	43	341	484	-15.2	43	-----	-----	-----	-----	
7,000	361	419	-26.3	51	357	415	-28.8	54	337	416	-25.6	47	356	417	-27.3	48	350	430	-16.7	42	329	423	-21.9	41	-----	-----	-----	-----	
8,000	357	364	-33.7	50	351	360	-36.3	52	331	362	-32.5	53	353	362	-34.8	47	346	376	-23.8	41	323	368	-29.1	40	-----	-----	-----	-----	
9,000	349	315	-41.0	41	350	311	-43.6	52	327	313	-39.3	53	353	312	-42.2	52	345	327	-30.8	40	314	320	-36.2	40	-----	-----	-----	-----	
10,000	344	272	-47.8	42	348	267	-50.2	52	316	270	-45.3	50	350	268	-48.7	52	340	284	-38.3	52	306	276	-43.0	52	-----	-----	-----	-----	
11,000	333	233	-52.5	42	344	229	-54.5	52	310	233	-50.3	53	348	231	-53.4	52	336	245	-45.8	52	299	233	-49.2	52	-----	-----	-----	-----	
12,000	326	199	-54.9	42	338	196	-55.7	52	292	199	-54.2	54	347	198	-55.7	52	333	210	-53.0	52	296	204	-53.9	52	-----	-----	-----	-----	
13,000	323	170	-56.2	42	320	167	-55.3	52	279	170	-57.1	53	336	169	-56.0	52	324	180	-59.6	52	284	174	-57.6	52	-----	-----	-----	-----	
14,000	315	145	-57.5	42	318	143	-55.3	52	261	146	-59.0	52	329	144	-56.5	52	316	153	-65.5	52	278	148	-60.8	52	-----	-----	-----	-----	
15,000	302	124	-59.3	42	303	122	-55.9	52	231	124	-60.6	52	312	123	-57.3	52	310	129	-70.0	52	262	126	-63.3	52	-----	-----	-----	-----	
16,000	279	106	-60.5	42	268	104	-56.7	52	201	106	-61.3	52	273	105	-58.1	52	300	109	-72.7	52	243	107	-64.9	52	-----	-----	-----	-----	
17,000	228	90	-60.7	42	221	89	-56.8	52	166	90	-61.6	52	225	90	-58.5	52	261	92	-72.7	52	217	91	-64.8	52	-----	-----	-----	-----	
18,000									158	76	-56.5	52	161	76	-53.3	52	211	78	-70.1	52	167	77	-63.5	52	-----	-----	-----	-----	
19,000																143	66	-66.6	52										
Altitude (meters) m. s. l.	St. Paul, Minn. (224 m.)			San Diego, Calif. ¹ (19 m.)			Sault Ste. Marie, Mich. (221 m.)			Seattle Wash. ¹ (27 m.)			Spokane, Wash. (598 m.)			Washington, D. C. (25 m.)													
	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature	Number of ob- servations		Pressure	Temperature					
Surface	363	989	7.4	80	342	1,012	16.7	82	366	989	3.8	84	336	986	10.1	74	7.4	73	365	900	9.2	69	343	959	11.7	65			
500	363	957	7.2	75	342	956	15.3	72	366	956	4.4	80	336	957	10.1	74	7.4	73	365	847	6.6	65	341	850	7.1	63			
1,000	363	900	6.0	72	342	901	14.5	57	366	899	2.8	76	336	901	7.4	73	365	847	4.4	74	336	847	4.8	62	340	800	4.8	62	
1,500	363	847	4.7	69	342	849	12.7	47	366	845	.9	73	335	848	4.4	73	365	797	1.6	72	365	797	3.7	64	340	752	2.5	59	
2,000	363	796	2.8	65	342	800	10.5	41	366	790	-3.0	66	335	748	-1.3	69	346	749	-4.0	65	362	703	-3.0	64	340	707	-2.2	56	
2,500	362	748	-1.5	61	341	753	7.8	38	366	745	-3.0	66	335	748	-1.3	69	346	749	-1.6	72	365	797	-1.1	64	340	752	-2.2	56	
3,000	362	703	-1.9	59	340	708	5.0	35	366	699	-5.4	63	335	703	-4.0	65	362	703	-3.0	64	340	707	-3.0	64	340	707	-2.2	56	
4,000	356	619	-7.4	55	333	626	-1.0	32	362	613	-10.6	60	334	618	-10.0	60	358	619	-9.2	61	335	623	-5.2	61	335	623	-5.2	52	
5,000	347	544	-13.4	51	332	551	-7.4	32	355	540	-16.5	56	333	542	-16.5	57	356	543	-15.7	58	328	548	-10.8	49	349	595	11.7	52	
6,000	342	476	-19.9	47	328	484	-14.3	33	349	471	-23.1	54	331	474	-23.4	55	352	475	-22.5	55	319	480	-17.2	46	346	850	7.1	52	
7,000	338	415	-26.9	45	322	424	-21.5	34	342	410	-29.9	46	328	412	-30.6	60	345	414	-29.8	53	304	420	-23.9	45	345	850	7.1	52	
8,000	334	361	-34.1	41	283	369	-28.9	33	337	356	-36.9	33	325	358	-37.8	33	340	359	-37.2	51	284	365	-30.9	33	340	850	7.1	52	
9,000	322	312	-41.1	41	277	320	-36.2	33	330	307	-43.3	33	319	309	-44.7	33	323	309	-44.3	33	279	316	-37.9	33	323	850	7.1	52	
10,000	315	269	-47.3	33	269	276	-42.8	33	318	264	-48.6	33	313	268	-50.7	33	323	266	-50.7	33	270	275	-43.9	33	323	850	7.1	52	
11,000	306	231	-51.7	33	248	238	-48.5	33	312	227	-52.0	33	307	228	-54.5	33	314	228	-54.8	33	228	228	-54.8	33	314	850	7.1	52	
12,000	293	198	-54.0	33	233	204	-53.4	33	298	194	-54.0	33	296	195	-55.4	33	302	195	-55.7	33	228	228	-55.7	33	302	850	7.1	52	
13,000	275	169	-55.5	33	205	174	-57.1	33	286	166	-55.2	33	284	167	-55.0	33	289	167	-54.9	33	228	228	-54.9	33	289	850	7.1	52	
14,000	259	144	-56.5	33	173	149	-60.2	33	288	142	-56.3	33	288	143	-55.1	33	274	142	-54.8	33	228	228	-54.8	33	274	850	7.1	52	
15,000	245	123	-57.1	33	142	127	-62.8	33	288</																				

TABLE 1. Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during year 1941—Continued

Altitude (meters) M. S. L.	Stations and elevations in meters above sea level																							
	Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				Pensacola, Fla. ¹ (24 m.)				Phoenix, Ariz. (339 m.)				Portland, Maine (20 m.)			
	Number of Observations	Pressure	Temperature	Relative Humidity	Number of Observations	Pressure	Temperature	Relative Humidity	Number of Observations	Pressure	Temperature	Relative Humidity	Number of Observations	Pressure	Temperature	Relative Humidity	Number of Observations	Pressure	Temperature	Relative Humidity	Number of Observations	Pressure	Temperature	Relative humidity
Surface.....	365	1,015	13.5	80	360	971	13.8	80	365	981	9.9	79	300	1,016	19.6	78	364	972	17.8	62	359	1,012	4.7	80
500.....	364	958	13.0	72	360	958	14.6	76	365	958	10.4	72	300	961	17.8	71	364	955	21.6	48	359	954	6.5	70
1,000.....	364	902	12.4	59	360	904	13.7	67	365	902	9.4	67	300	907	15.7	65	364	901	19.6	42	359	898	4.3	68
1,500.....	364	849	10.3	53	360	852	11.8	65	365	849	8.0	62	300	855	13.4	62	364	850	16.2	42	359	844	2.1	65
2,000.....	364	799	7.6	49	360	802	9.4	62	364	799	5.8	60	300	805	11.1	57	364	801	12.4	44	359	793	0	65
2,500.....	364	752	4.8	45	360	755	6.8	57	364	751	3.3	58	300	758	8.6	54	364	754	8.8	45	358	745	-2.2	63
3,000.....	364	707	2.0	42	359	710	3.9	55	364	706	.7	57	299	713	6.1	51	364	709	5.3	46	358	699	-4.5	51
4,000.....	364	624	-4.1	39	355	627	-2.0	51	356	623	-5.2	53	292	631	.7	48	356	627	-1.1	43	355	615	-9.7	53
5,000.....	364	549	-10.6	37	348	552	-8.2	47	351	548	-11.3	48	275	556	-5.2	48	356	553	-7.5	40	350	540	-15.6	54
6,000.....	361	481	-17.6	37	344	485	-14.7	44	346	480	-17.9	45	232	488	-12.7	46	352	485	-14.3	38	346	472	-22.0	51
7,000.....	358	420	-24.9	36	337	424	-21.6	41	332	419	-25.0	42	223	427	-19.5	47	345	425	-21.4	36	339	411	-29.0	50
8,000.....	354	368	-32.2	36	329	369	-28.8	39	327	364	-32.3	40	178	372	-26.7	46	342	370	-28.7	35	332	357	-35.9	48
9,000.....	350	316	-39.4	35	319	320	-35.8	38	315	316	-39.4	39	166	323	-33.9	329	321	33.9	322	308	322	308	42.4	44
10,000.....	342	273	-46.0	30	313	277	-42.5	30	303	272	-45.7	30	147	280	-41.3	324	278	-42.9	313	265	347	265	-47.8	44
11,000.....	330	234	-51.3	30	302	238	-48.6	30	291	234	-50.7	30	118	241	-48.6	315	239	-48.1	307	228	313	228	-51.4	44
12,000.....	321	201	-54.5	29	295	204	-53.6	29	277	200	-54.1	29	96	206	-56.0	305	205	-52.3	296	195	313	195	-53.7	44
13,000.....	313	171	-56.2	28	287	175	-57.4	28	261	171	-56.5	28	57	175	-57.7	297	175	-55.7	279	167	313	167	-55.4	44
14,000.....	302	146	-57.6	27	277	149	-60.4	28	248	146	-57.6	27	57	146	-58.8	289	150	-58.8	257	142	313	142	-58.6	44
15,000.....	284	125	-59.0	25	257	128	-62.8	25	230	124	-59.6	25	57	124	-62.8	270	127	-61.6	227	122	313	122	-57.9	44
16,000.....	261	108	-60.3	24	241	108	-64.4	24	199	106	-60.6	24	57	106	-64.4	251	108	-63.8	180	104	313	104	-58.3	44
17,000.....	228	90	-60.5	20	202	91	-64.6	20	169	90	-60.5	20	57	90	-64.2	231	92	-64.2	124	89	313	89	-57.8	44
18,000.....	175	77	-60.0	20	202	91	-64.6	20	169	90	-60.5	20	57	90	-63.2	184	78	-63.2	124	89	313	89	-57.8	44

NOTES.—All data are based on observations during 12 months except at Atlanta for which only 11-months data were available, no observations having been made during January.

Data only for stations in Continental United States are published in this table. Data for other stations will be published in a later issue.

January. At some stations data were missing during 1 or 2 months at higher levels. Data were not published for any level where observations were missing for more than one month in the same season or more than 2 months during the year.

- ¹ Navy stations.
- ² Airplane observations.

TABLE 2.—Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during year 1941. Directions given in degrees from North ($N=360^\circ$, $E=90^\circ$, $S=180^\circ$, $W=270^\circ$) velocities in meters per second

TABLE 2.—Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during year 1941. Directions given in degrees from North ($N=360^\circ$, $E=90^\circ$, $S=180^\circ$, $W=270^\circ$) velocities in meters per second—Continued

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)	Oakland, Calif. (8 m.)	Oklahoma City, Okla. (402 m.)	Omaha, Nebr. (306 m.)	Phoenix, Ariz. (338 m.)	Rapid City, S. Dak. (982 m.)	St. Louis, Mo. (181 m.)	San Antonio, Tex. (180 m.)	San Diego, Calif. (16 m.)	Sault Ste. Marie, Mich. (230 m.)	Seattle, Wash. (12 m.)	Spokane, Wash. (603 m.)	Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations		
Surface	341	279	2.5 354	254	3.3 328	183	2.1 342	215	1.1 365	247	0.8 345	352	1.8		
500	340	278	4.6 353	257	2.1 328	182	2.5 341	217	1.6 365	241	1.0	340	246		
1,000	329	268	6.4 326	258	1.9 322	193	3.4 328	235	2.6 365	227	1.3 345	350	1.8		
1,500	303	295	7.6 306	250	1.9 307	222	4.1 299	246	4.0 363	212	2.0 345	310	2.5 303		
2,000	248	298	8.7 292	250	2.0 291	241	4.6 265	258	5.4 354	214	2.6 324	256	3.8 280		
2,500	204	300	9.6 281	261	2.0 273	255	5.6 241	271	6.7 344	223	3.3 297	283	5.4 257		
3,000	269	286	6.2 262	262	6.5 222	279	7.7 340	233	4.0 281	281	7.1 244	276	8.1 200		
4,000	239	307	4.2 216	270	8.4 201	286	9.9 312	246	5.4 254	279	9.2 218	280	10.1		
5,000	—	—	—	188	273	9.9 183	290	11.1 291	257	7.0 226	281	10.6 190	283	11.5	
6,000	—	—	—	—	—	—	147	292	12.7 264	261	8.4 191	282	12.1 164	284	13.0
8,000	—	—	—	—	—	—	—	207	268	11.8	—	—	—	—	

TABLE 3.—Maximum free-air wind velocities, (m. p. s.), for different sections of the United States based on pilot balloon observations during the year 1941

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast ¹	48.0	WNW	2,500	Nov. 27	Boston, Mass.	61.0	WNW	2,980	Nov. 27	Boston, Mass.	72.6	NW	11,220	Aug. 10	Buffalo, N. Y.
East-Central ²	44.2	WNW	2,050	Feb. 17	Louisville, Ky.	68.0	WNW	3,520	Feb. 18	Norfolk, Va.	85.0	SSW	7,650	Nov. 8	Greensboro, N. C.
Southeast ³	37.7	NW	2,320	Feb. 18	Spartanburg, S. C.	48.4	W	5,000	Jan. 4	Jacksonville, Fla.	73.8	WNW	9,580	Mar. 12	Jacksonville, Fla.
North-Central ⁴	50.4	SW	1,570	Dec. 3	Marquette, Mich.	63.2	WSW	3,170	Oct. 7	Muskegon, Mich.	78.0	N	8,740	Dec. 5	Fargo, N. Dak.
Central ⁵	57.6	SSW	1,100	Apr. 13	Des Moines, Iowa	68.8	NW	4,420	Jan. 30	Moline, Ill.	73.6	W	12,470	Dec. 6	Wichita, Kan.
South-Central ⁶	42.8	S	1,900	May 19	Amarillo, Tex.	53.6	S	4,210	Apr. 19	Dallas, Tex.	84.0	WSW	9,970	Dec. 5	Oklahoma City, Okla.
Northwest ⁷	43.5	W	2,300	Nov. 24	Harve, Mont.	61.5	WSW	4,280	June 25	Havre, Mont.	77.0	N	10,220	Oct. 2	Great Falls, Mont.
West-Central ⁸	48.6	SSW	2,080	Sept. 19	Modena, Utah	56.6	SSW	3,560	June 26	Modena, Utah	79.2	NW	9,920	Feb. 9	Pueblo, Colo.
Southwest ⁹	53.0	SSW	2,500	Mar. 31	Phoenix, Ariz.	80.0	WNW	5,000	Feb. 12	Winslow, Ariz.	91.6	NNW	9,820	Feb. 9	Albuquerque, N. Mex.

¹ Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Northern Ohio.

Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee and North Carolina.

**• South Carolina, Georgia, Florida and Alabama.
• Michigan, Wisconsin, Minnesota, North Dakota.**

**Michigan, Wisconsin, Minnesota, North Dakota and South Dakota,
Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri.**

• ILLINOIS, IOWA, KANSAS AND MISSOURI.

⁶ Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and Western Tennessee.
⁷ Montana, Idaho, Washington and Oregon.

⁷ Montana, Idaho, Washington and Oregon.
⁸ Wyoming, Colorado, Utah, Northern Nev.

• Wyoming, Colorado, Utah, Northern Nevada and Northern California.
• Southern California, Southern Nevada, Arizona, New Mexico, and ex

Southern California, Southern Nevada, Arizona, New Mexico, and extreme West Texas.

Texas,

TABLE 4.—*Monthly mean heights of freezing temperatures (0° C.) during year 1941, from mean monthly values based on airplane and radiosonde observations*

Stations	Elevation in meters (m. s. l.)																									
	January		February		March		April		May		June		July		August		September		October		November		December			
	Number of observations		Altitude in hundreds of meters (m. s. l.)		Number of observations		Altitude in hundreds of meters (m. s. l.)		Number of observations		Altitude in hundreds of meters (m. s. l.)		Number of observations		Altitude in hundreds of meters (m. s. l.)		Number of observations		Altitude in hundreds of meters (m. s. l.)		Number of observations		Altitude in hundreds of meters (m. s. l.)		Number of observations	
Albuquerque, N. Mex.	1,620	31	(1)	28	(1)	17	28	29	30	28	40	30	44	29	47	30	48	28	46	30	33	34	31	27	31	34
Anchorage, Alaska	42	31	(1)	28	(1)	31	5	30	9	30	12	30	23	28	22	31	19	28	31	46	30	30	31	31	31	35
Atlanta, Ga.	300	31	(1)	28	(1)	31	22	30	34	30	40	31	46	29	49	30	48	31	46	30	30	(1)	30	31	33	31
Barrow, Alaska	6	31	(1)	28	(1)	31	(1)	30	(1)	31	(1)	30	17	31	18	31	22	31	(1)	30	(1)	30	(1)	(1)	(1)	(1)
Bethel, Alaska	7	31	(1)	27	(1)	31	(1)	28	3	31	8	30	22	31	24	30	29	22	31	5	24	(1)	(1)	(1)	(1)	
Bismarck, N. Dak.	505	31	(1)	27	(1)	30	(1)	30	21	30	32	29	39	31	46	30	43	30	35	31	28	30	17	31	31	(1)
Boise, Idaho	864	31	(1)	28	(1)	31	39	28	44	31	45	29	50	31	49	31	49	31	51	31	49	30	42	5	42	28
Brownsville, Tex.	6	31	37	27	38	31	39	28	44	31	45	29	50	31	49	31	49	31	51	31	49	30	42	5	42	10
Buffalo, N. Y.	221	15	(1)	28	(1)	31	(1)	30	23	31	28	30	39	31	47	31	48	31	47	30	47	30	36	30	35	35
Charleston, S. C.	14	31	26	28	22	31	22	30	34	30	39	29	44	29	47	31	48	31	48	30	47	30	36	30	31	35
Denver, Colo.	1,616	31	(1)	28	(2)	30	20	30	26	27	38	30	42	28	47	29	47	29	43	30	44	30	36	30	31	(2)
Detroit, Mich.	194	31	(1)	28	(1)	30	30	30	29	31	42	30	45	28	48	30	43	31	44	30	43	30	42	31	31	6
El Paso, Tex.	1,193	31	28	28	30	30	30	29	35	31	42	30	45	28	48	30	43	31	44	27	42	25	37	31	32	32
Ely, Nev.	1,908	31	(1)	28	(2)	31	(2)	30	23	31	36	30	40	31	47	29	44	31	38	31	31	30	30	31	31	(1)
Fairbanks, Alaska	156	31	(1)	28	(1)	30	(1)	30	11	31	16	29	25	31	26	31	15	30	(1)	30	(1)	(1)	(1)	(1)	(1)	
Great Falls, Mont.	1,128	31	(1)	28	(1)	31	17	30	23	30	30	28	37	31	42	31	42	30	26	31	28	29	25	30	30	
Huntington, W. Va.	172	31	(1)	28	(1)	31	17	30	23	30	30	28	37	31	42	31	42	30	26	31	24	31	24	31	20	
Joliet, Ill.	178	31	(1)	28	(1)	30	(1)	27	24	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	10	
Juneau, Alaska	49	23	21	28	3	30	8	28	11	29	15	28	21	26	27	29	28	31	20	27	13	29	4	31	(1)	
Ketchikan, Alaska	26	31	7	26	7	29	11	27	14	31	15	30	24	30	30	31	31	30	21	26	17	28	10	28	(1)	
Lake Charles, La.	5	31	(1)	26	(1)	30	(1)	30	24	31	28	30	29	45	29	42	29	44	31	37	29	41	21	25	(2)	
Lakehurst, N. J.	39	31	(1)	26	(1)	30	(1)	30	24	31	28	30	40	29	45	29	42	29	44	31	37	29	41	31	38	
Medford, Ore.	401	31	20	27	21	30	24	29	22	31	28	31	31	46	31	43	31	48	30	43	30	43	30	43	30	
Miami, Fla.	4	30	37	27	38	31	38	27	42	31	44	30	45	31	47	30	47	31	48	30	43	30	43	30	43	
Nashville, Tenn.	180	31	18	28	5	31	13	30	32	31	37	30	43	29	47	30	49	31	50	29	44	28	30	28	30	
Nome, Alaska	14	31	(1)	28	(1)	31	(1)	30	(1)	30	7	28	25	30	23	26	31	29	17	30	2	30	(1)	(1)		
Norfolk, Va.	10	24	12	17	(1)	23	12	21	30	28	35	13	42	20	46	25	45	23	45	18	42	24	31	21	27	
Oakland, Calif.	2	31	24	28	24	31	26	30	24	31	35	30	38	31	46	31	43	31	42	31	36	30	35	30	33	
Oklahoma City, Okla.	391	31	24	23	25	30	23	30	32	31	40	29	44	31	47	31	48	29	49	27	42	30	32	31	30	
Omaha, Nebr.	301	31	(1)	28	(1)	31	7	30	27	31	35	27	41	31	46	30	47	30	44	27	37	29	35	31	31	
Pearl Harbor, T. H.	6	27	32	28	28	31	30	27	39	26	45	28	46	20	46	21	47	19	47	22	48	22	37	22	37	
Pensacola, Fla.	24	27	22	28	29	31	28	30	28	30	44	31	51	27	51	31	49	31	40	29	38	31	31	31	31	
Phoenix, Ariz.	339	31	22	28	29	31	28	30	28	30	44	31	51	27	51	31	49	31	40	29	38	31	31	31	31	
Portland, Maine	20	30	(1)	28	(1)	31	(1)	30	20	27	24	30	35	31	40	31	44	31	41	30	45	30	42	29	(1)	
St. Louis, Mo.	171	18	3	28	(1)	31	8	30	27	35	29	42	31	46	30	47	30	46	30	41	29	46	30	42	22	
St. Paul, Minn.	225	30	(1)	28	(1)	31	(1)	30	24	31	34	29	42	31	45	29	42	31	40	31	32	29	45	31	(1)	
San Antonio, Tex.	174	31	(1)	28	(1)	30	41	31	44	29	48	31	50	29	51	31	52	31	48	30	49	30	41	31	39	
San Diego, Calif.	19	30	28	24	30	27	28	27	27	29	41	29	45	30	47	30	49	30	49	28	40	27	37	31	32	
San Juan, P. R.	15	27	27	49	28	50	26	47	30	49	28	47	30	48	27	50	30	49	29	48	29	48	27	47	47	
Sault Ste Marie, Mich.	221	31	(1)	28	(1)	31	(1)	30	19	31	27	30	37	31	40	31	35	30	36	31	35	30	35	31	(1)	
Seattle, Wash.	27	17	15	28	18	31	19	28	20	30	22	30	27	30	39	31	35	29	35	31	35	30	30	20	20	
Spokane, Wash.	598	31	(2)	27	15	31	18	30	22	31	27	30	33	31	41	29	38	30	26	31	26	29	20	31	(1)	
Swan Island, West Indies.	10	30	47	27	49	31	50	30	50	28	50	30	50	31	49	30	48	30	50	30	52	29	51	31	51	
Washington, D. C.	24	24	(1)	21	(1)	31	8	29	28	31	30	42	28	47	26	46	31	48	31	40	30	47	29	48	18	

¹ Surface.² Mean monthly temperature at surface was 0° C. or lower, above which was an inversion with mean temperatures above freezing.³ Data not yet received.

At Coco Solo and St. Thomas the level of average freezing conditions was not reached.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Precipitation was above normal during December 1941 in the Atlantic Slope States from Pennsylvania southward, the East Gulf States, the Central Plains States and all States west of the Rocky Mountains. Most of the Ohio Basin continued dry and the extreme upper and lower Mississippi basins and Texas were below normal; New England and New York were slightly below normal. Floods mostly minor, occurred principally in portions of the Southeastern States and in the Pacific slope drainage.

Atlantic Slope drainage.—General heavy rains over the entire watershed of the Susquehanna River on December 23–24, produced the highest flows in the basin since the first half of April, except for the Juniata River where the previous highs were recorded in June. Stages near the flood level were reached in portions of the upper basin and a stage of 13 feet, 1 foot above flood stage, was reached in

the Tioughnioga River at Whitney Point, N. Y., on the 25th.

Minor flooding occurred in portions of the Santee, Savannah, Ogeechee, and Altamaha River systems near the end of the month. Two periods of heavy rain occurred over this area during the month. The first period of rain occurred on the 3d and 4th in connection with a disturbance over the East Gulf, and caused only slight rises in the river stages but served to bring water levels above the low stages which had existed previously. On the early morning of the 23d a well-developed low was centered over southwestern Missouri with a ridge of high pressure along the Atlantic coast. The steep east-west pressure gradient between the advancing low-pressure system and the high-pressure ridge produced a strong influx of warm moist tropical air east of the Mississippi River and resulted in unusually heavy rains over the Southeastern States. The rivers rose rapidly, reaching flood stage, or slightly higher, at a few points. At Haw-